Exploration of Teaching New Energy Materials and Technology with Integrated Ideological and Political Education: A Case Study on the Curriculum "Key Materials and Technologies in Post-Lithium-Ion Batteries"

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Abstract: This paper discusses the integration of ideological and political education within the curriculum "Key Materials and Technologies in Post-Lithium-Ion Batteries", aligning with President Xi's guidelines on fostering virtue through education and the national 14th Five-Year Plan for renewable energy development. The curriculum aims to impart professional knowledge while enhancing students' professional identity, national consciousness, and sense of social responsibility. The study covers curriculum design, strategies for integrating ideological elements, and the assessment of teaching effect. It concludes with insights into contributions to the ideological and political construction of higher education curricula and suggests continuous optimization and interdisciplinary cooperation.

***Keywords*:** ideological and political education; new energy materials; post-lithium-ion batteries; general education; fostering virtue through education

1. Introduction

In the context of the global energy transition, higher education plays a critical role in developing future talent[1]. The National Conference on Ideological and Political Work in China's universities[2] and colleges emphasized the importance of fostering virtue through education. Alongside the 14th Five-Year Plan for renewable energy development[3], the study of new energy materials and technologies has become crucial. Integrating ideological and political education[4] into the curriculum "Key Materials and Technologies in Post-Lithium-Ion Batteries" aims to cultivate high-quality talent with social responsibility, innovative spirit, and practical skills. The integration seeks to meet the needs of professionals in the new energy industry, promote the advancement of higher education, and contribute to optimizing China's energy structure and green, low-carbon development[5].

2. Ideological and Political Education and Teaching Objectives

2.1 Ideological and Political Education

This curriculum merges knowledge transmission with value guidance to impart professional knowledge while helping students establish correct values, perspectives, and worldviews. It uses professional curricula as platforms for both technical knowledge and ideological education, focusing on seamlessly integrating ideological elements into the professional framework to develop well-rounded individuals with professional expertise, moral integrity, and societal responsibility.

2.2 Teaching Objectives

Comprehensive Understanding of Post-Lithium-Ion Batteries: The primary objective is to enable students to grasp the basic knowledge, principles, and latest research developments in post-lithium-ion batteries, laying a foundation for future studies and applications in the new energy sector.

Enhancing Professional Identity and Pride: By highlighting the importance of new energy materials and technologies for national energy transformation and sustainable development, the curriculum aims to foster students' passion and pride in their field, strengthening their professional identity.

Cultivating National Consciousness and Social Responsibility: Alongside professional training, the curriculum also fosters students' awareness of national issues and social responsibilities, linking their studies to national development strategies and societal needs, and promoting a commitment to scientific advancement for national prosperity.

3. Curriculum Design and Implementation

3.1 Curriculum Content Development

The curriculum "Key Materials and Technologies in Post-Lithium-Ion Batteries" provides comprehensive educational materials. It starts with the basic knowledge of electrode materials—detailing chemical composition, physical properties, and operational principles to establish a strong theoretical foundation. It then explores advanced topics like sodium-ion, solid-state, and aqueous batteries to expose students to the latest developments in energy materials. Additionally, the curriculum examines global market trends, policy frameworks, and innovative cases in the new energy sector, helping students understand industry dynamics and future directions.

3.2 Strategies for Integrating Ideological and Political Education

The curriculum utilizes various methods to effectively integrate ideological and political education. It highlights how new energy materials and technologies contribute to national energy security and environmental protection, enhancing students' patriotism and social responsibility. Features include expert lectures on new energy research and responsibilities, enriching the learning experience. A combined online-offline teaching model ensures robust knowledge delivery and enriches interactions, making the ideological content more tangible and engaging.

3.3 Teaching Implementation Pathway

The teaching approach is segmented into "pre-class, in-class, post-class" phases. Pre-class activities set the stage with relevant background and policies, piquing interest and situational understanding. During class, techniques like case studies and discussions blend professional knowledge with ideological education, encouraging students to reflect on the societal impact of new energy materials and technologies. Post-class tasks and recommended readings promote practical application of knowledge. This structured method ensures deep integration and engagement with ideological and political education throughout the course.

4. Teaching Methods and Assessment

4.1 Teaching Methods

The curriculum "Key Materials and Technologies in Post-Lithium-Ion Batteries" employs various teaching methods to enhance student engagement, learning outcomes, and ideological and ideological education:

Lecture and Discussion: Traditional lectures deliver theoretical knowledge, while discussions promote critical thinking on societal roles and the significance of new energy materials, enhancing social responsibility.

Flipped Classroom and Project-Based Learning: Students acquire foundational knowledge through pre-class readings or online learning, and use class time for discussions and problem-solving. Project-based learning, involving tasks like designing electrode materials or market analysis, enriches practical understanding.

Field Trips and Expert Lectures: Visits to industry sites and lectures by experts offer insights into the energy sector, expanding student perspectives and fostering professional identification.

4.2 Assessment System

A diverse assessment system measures learning outcomes and teaching efficacy:

Knowledge Mastery Assessment: Regular assignments and lab reports, assess students' grasp of professional knowledge.

Ideological and Political Education Assessment: Feedback on curriculum content, teaching methods, and ideological integration is collected. Students' demonstration of social responsibility and national consciousness during discussions, projects, and field trips is documented.

Comprehensive Skills Assessment: Project reports showcasing outcomes from project-based learning are required. Practical activities, including participation during field trips and expert lectures, are assessed to evaluate overall qualities and skills.

These methods and evaluations aim to advance technical skills, instill values, and promote social responsibilities, developing well-rounded professionals in the field of new energy materials and technologies.

5. Practice Effect and Reflection

5.1 Practice Effect

Professional Knowledge and Ideological Literacy Enhancement: Teaching the "Key Materials and Technologies in Post-Lithium-Ion Batteries" curriculum has markedly enhanced students' professional and political literacy. They have

mastered the basic principles, technologies, research methods, and applications of post-lithium-ion batteries, gaining a profound understanding of national energy policies and commitment to sustainable goals.

Student Satisfaction and Engagement analysis: Survey feedback shows high satisfaction with the curriculum, citing its rich content and varied teaching methods that engage interest in new energy materials. High involvement in discussions, projects, and field trips has boosted their motivation and practical skills.

5.2 Summary and reflection of experience

Successful experience sharing: The curriculum's success stems from effectively blending professional education with ideological and political learning, using varied methods like case studies, projects, and expert lectures. Regular updates and industry links keep the content relevant and practical.

Existing problems and improvement directions: Challenges include incomplete grasp of ideological content by some students and the need for finer teaching designs. Future enhancements will focus on strengthening ideological case studies and continually refining content and methods to align with student and industry needs.

Recommendations for Future Curriculum Development: Future efforts should aim to integrate theory with practice more robustly, innovate teaching approaches, and enhance interdisciplinary connections. Strengthening industry partnerships can provide more practical opportunities. Additionally, boosting teacher training will improve their effectiveness in delivering ideological and political education.

6. Conclusion

The curriculum "Key Materials and Technologies in Post-Lithium-Ion Batteries" effectively integrates professional knowledge with ideological and political education. This approach has heightened students' awareness of new energy sources, deepened their understanding of the national energy strategy, and strengthened their professional identity and sense of social responsibility. The success of the curriculum design is reflected in the substantial improvement in students' mastery of professional knowledge, enhancement of ideological and political literacy, and increased practical skills. This curriculum serves as a practical exploration of integrating ideological and political education within higher education, providing an effective model and framework. The enriching instructional content, including case studies and interactive discussions, has boosted learning motivation and social engagement. Moving forward, there will be continuous optimization of curriculum design and teaching methods. Efforts to enhance interdisciplinary collaboration will expand the horizons of ideological and political education and promote the widespread adoption and application of curriculum ideals.

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